Acquisition Warrior 1999

New Games for Acquisition In the New Millennium — Wargaming Meets Best Business Practices

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A business war game in which 86 representatives from government, academia, allied navies, and industry participated, was sponsored by the Navy's Program Executive Office for DD 21 and hosted by the Navy's Acquisition Center of Excellence (ACE). The ACE merged the processes of wargaming and best business practices with a unique capability — Acquisition Warrior. Acquisition Warrior (AW99), conducted in May, represented a unique forum for "… an open exchange of ideas to increase a body of knowledge."[1]

NAVY CAPT. GARY BARRETT (NAVY WARFARE DEVELOPMENT COMMAND) LEADS THE DISCUSSION FOR THE ACQUISITION CELL, USING DISPLAY TECHNOLOGY AVAILABLE AT THE NAVY'S ACQUISITION CENTER OF EXCELLENCE COLLABORATORY.

Understanding, Recognizing, Managing Tomorrow's Acquisition Challenges

AW99 addressed a fundamental issue facing acquisition managers of future defense systems: the lack of a prescribed methodology for ensuring that systems under development address future warfighting requirements (e.g., Network Centric Warfare [NCW]). The intent of AW99 was to identify new approaches to meet emerging warfighting capabilities in the context of NCW. The results are expected to help DoD recognize, understand, and manage tomorrow's acquisition challenges.

AW99 was designed to provide a forum for the exploration of newer, clearer paths through the often complex acquisition process. It also provided insight to the emerging policy, strategy, and operational requirements of complex weapon systems within NCW.

The primary task of the game participants was to examine and identify issues and insights, forging a new understanding of the relationship between NCW capabilities and the acquisition-related processes. The fundamental integrating theme for AW99 — to identify ways to buy [surface combatant] systems that meet existing and future warfighting requirements — relates to the necessary "traction" of the co-evolving fleet operating concepts and the acquisition processes.

The Revolution in Military Affairs engenders a co-evolution of doctrine, organization, and technology. The Revolution in Business Affairs looks to improve linkages with requirements, budget, and acquisition methods. The nexus of the two — where technology meets requirements — was the main focus of AW99. Clearly defined, AW99 provides the linkage or "traction" between the worlds of operation and business (Figure 1). AW99 participants sought to develop a greater understanding of the key issues surrounding the evolving acquisition landscape, particularly regarding DD 21 and the acquisition processes for achieving capability in a network centric environment.

The DD 21 program was used as the case study, or pilot program, for gaming AW99. Navy Rear Adm. Joe Carnevale (PEO DD 21), in an address to participants of AW99, raised the following questions for future consideration:

"How do we fuse the Navy's overarching network centric environment with

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industry's fully integrated, distributed processing ship?"

"What are the most important characteristics (qualities) that must be addressed in order to be a highly effective node in a network centric environment?"

Game Objectives and Design

The overall objective of AW99 was to answer these questions by developing strategies to buy systems that will meet existing and future warfighting requirements in view of co-evolving fleet operating concepts and new acquisition processes. Specifically, the goals were to:

- Examine the concepts of a future surface combatant (or any weapon system) as a node in network centric warfare.
- Develop assessment criteria by which to evaluate various aspects of the ship within the broader network.
- Explore new acquisition processes for achieving network centric capabilities to the extent that such processes can help to lead the Revolution in Business Affairs.

AW99 was conducted as an interactive and dynamic process, based on wargaming techniques and reinforced by decision support tools. Participants were grouped into four teams (Warfighting, Logistics, Technology, and Acquisition)

and met in an interactive seminar environment to discuss and resolve issues framed by the formal briefings and the dynamic course of game play. Figure 2 depicts the overall game approach. To accomplish this, the game construct began at a broad view, or macro level, with an understanding of the environment (Move I), then began focusing on the network (Move II), and finally refined the discussion to the weapon system (Move III).

The Game

In his keynote address, Under Secretary of the Navy Jerry Hultin provided a provocative and substantive 45-minute kick-off speech to game participants. He discussed the "heavy" acquisition system, established to defend U.S. interests against the Cold War threat, and challenged participants to strip out the "excess baggage." Not only is the system expensive, but moreover, it "saps innovation and ideas."

According to Hultin, we must apply energy to "solving the problems on how to make the global economy sing and at the same time, taking out a rogue player that's threatening stability." Very familiar with ongoing efforts within the DD 21 program, Hultin also told participants, "The Pentagon is watching. In many ways DD 21 acts as a forcing function for the whole enterprise to rethink how it operates."

ACQUISITION WARRIOR BRINGS DISCIPLINE TO BUSINESS ANALYSIS

Acquisition Warrior Brings the Rigor and Discipline of Operations Analysis to Business Analysis

The military has benefited from the power of war games for more than a hundred years. Navy Adm. Chester W. Nimitz was fond of reporting that he could predict and play out virtually all the World War II battles of the Pacific (with the exception of the use of kamikazes). During the early and mid 1980s, games repeatedly predicted the fall of the Soviet Union.

Since the mid 1980s, wargaming has been successfully adapted for commercial purposes. Forward–looking companies have discovered the "power of practice": trying out market moves in a simulated environment where innovative, bold ideas can be "dry–run" to determine likely outcomes in a dynamic, and therefore, more realistic environment. Through business wargaming, companies have learned to generate better information, analyze that information, make sound choices quickly, and convert strategic choices into decisive action.

The Navy's Acquisition Center of Excellence (ACE) recognizes the value "gaming" has traditionally provided to military forces and more recently to world–class corporations. The ACE, with guidance from Professor Bud Hay, at the Naval War College, developed a series of war games — Acquisition Warrior — the first of which was held in April 1998 and focused on developing the best acquisition strategy for an integrated topside (island) for the CVN 77. As the U.S. Armed Forces change their strategic and operational concepts to meet emerging challenges in the 21st century, there will be significant differences in the way battles are fought. The aim of business wargaming in the acquisition process is to determine how the acquisition of defense systems must also change to support these differences.
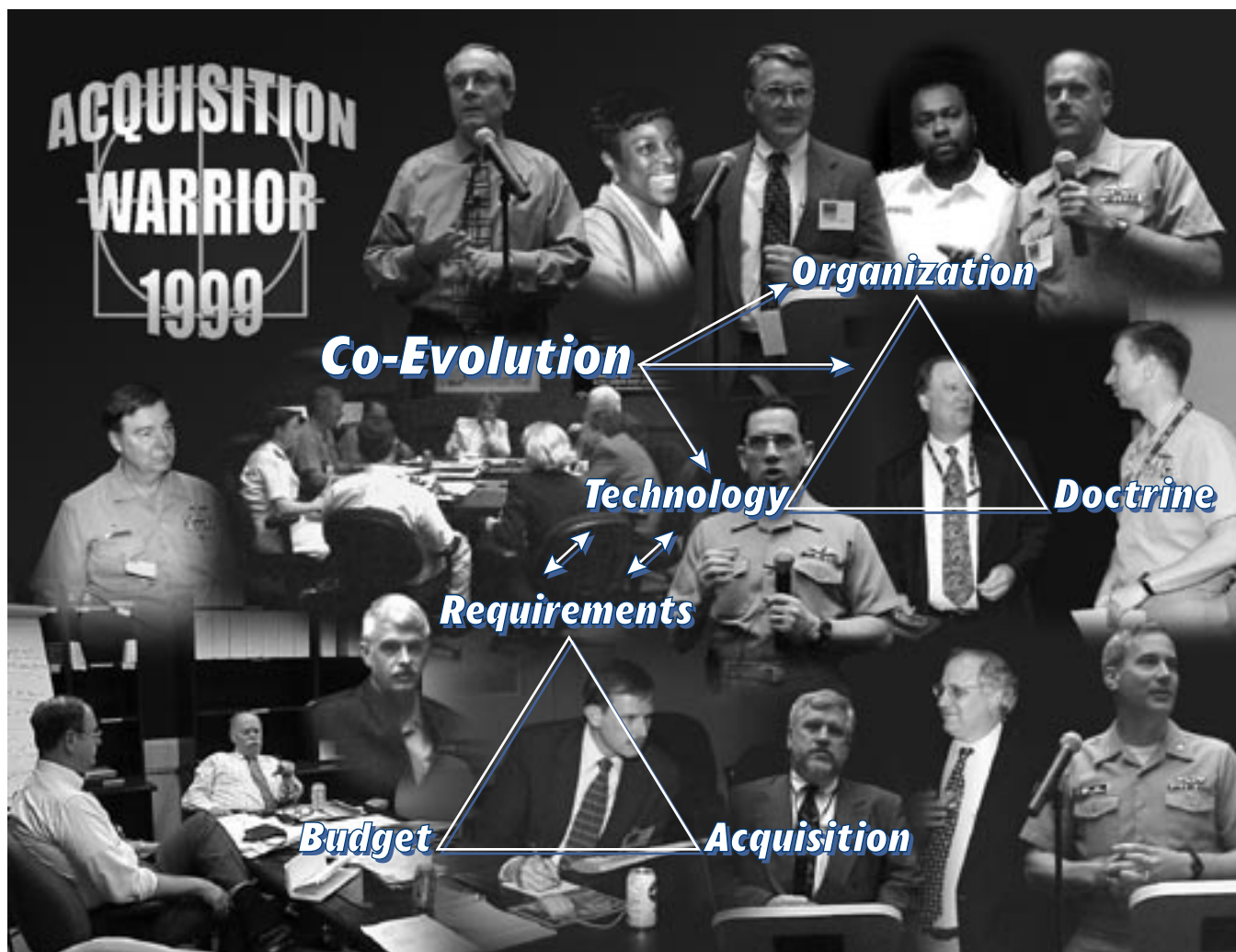
FIGURE 1. **Traction Between Warfighting and Acquisition Communities**

The game continued with a series of briefings and an interactive panel discussion. Figures 3 and 4 present the key points raised during these sessions.

Executive Session

The executive session was held on the last day of the war game and included a round-table discussion in which a representative from each of the teams outbriefed issues, insights, and recommendations noted throughout the game. The objective of this session was to set course for the Senior Executive Panel toward the "road ahead," using an interactive panel discussion format. The executive session began with a summation of all the teams' work that directly addressed Carnevale's questions. A compilation of the teams' completed work produced an extensive list of characteristics, consolidated and aggregated into four main areas:

• Interoperability
• Training/Human-Machine Interface (HMI)
• Quality of Service
• Supportability

Figure 5 summarizes the major characteristics identified.

Following the consolidation of characteristics, a top-level summation of the Key Acquisition Findings was presented to the Executive Panel (Figure 6). The panel concluded that the acquisition process had to become faster if DoD expected to keep pace with newer environments. Eileen Roberson, Acquisition Reform Executive, Office of the Assistant Secretary of the Navy (Research, Development and Acquisition), also noted this requirement for "speed" was not only to keep pace with the technol-

ogy itself, but to recognize that the threat is changing as fast as the technology.

The Warfighting team reviewed issues related to network architecture; system boundaries; interoperability; and concepts and doctrine. It focused on the critical issue of optimizing the flow of information throughout the battlespace, and recognized the information flow had to be up, down, and across the chain of command. The team identified, as a significant tension, the need for a network system architect. It recommended identifying the full scope of responsibilities within the Navy network architecture, in conjunction with joint efforts.

The Logistics team identified the need for a "logistics grid" as an interoperable component of NCW (used with the traditionally identified NCW grids: sensor,
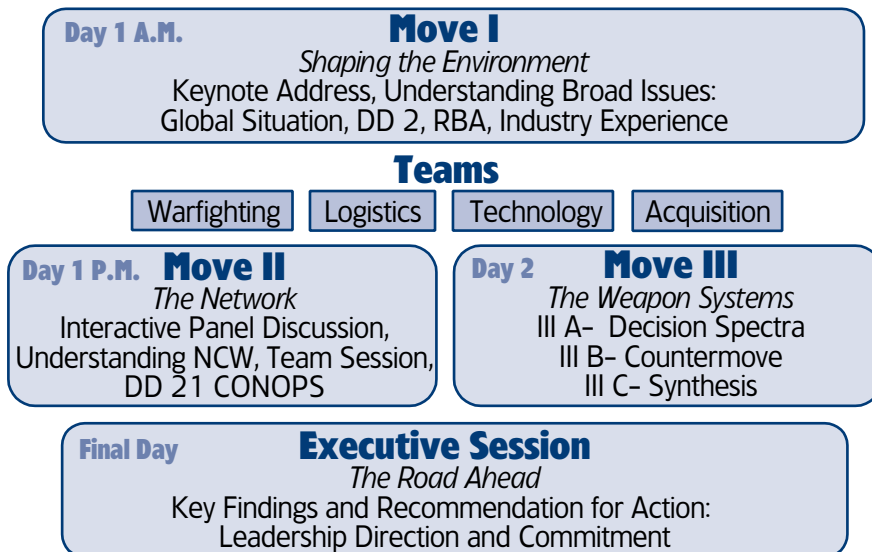
FIGURE 2. **Acquisition Warrior '99 Game Approach**

- **Challenge**
  - Shift from platform centric to network centric acquisition process
  - Requires new ways of thinking: a revolution
  - DD 21 as the forcing function
- **Context (global geo-strategic environment)**
  - Need to impose order on chaos
    - > Failing states in widespread areas
    - > Periodic, episodic resource interruptions
    - > Increasingly complex situations
  - We are going to have to be "out there"
    - > Timely responsiveness will be key
    - > High op tempo
    - > Emerging training requirements
  - Information and connectivity are key
- **Revolution in Business Affairs**
  - Off–loading responsibilities to shore
  - Understanding and managing risk
  - Integrating infrastructure stovepipes
  - View Navy as a total environment
- **Case Study: Cisco Systems**
  - Must think big in a networking environment
    - > Incremental and marginal changes not enough
  - Information availability and ubiquitous connectivity central to the enterprise
  - Must allow for ample flexibility
- **Knowledge Management**
  - Look beyond the "buzzword" for a structure to collect and disperse knowledge
- **Advanced Naval Fires Concepts**
  - Improved sensing
  - Integrate netted information into knowledge for the warfighter

FIGURE 3. **Summary of Informational Briefings**

information, and engagement), plus several characteristics of the grid, which paralleled NCW. Ideally, the logistics grid improves availability as well as sustainability. The team recommended including a sustainability metric for all levels of the battlespace (e.g., theater, battlegroup, the node [ship], and subsystems).

The Technology team paid particular attention to the overall game objective of developing assessment criteria for a node in NCW. Further, the team identified the need to define metrics for a "good" node. A significant tension is balancing interoperability with interdependence. As one team member commented, "The good news is everybody's connected, the bad news is everybody's connected."

The team concluded technology is not a "limiting" factor for NCW. The challenge is to harness the technology and be able to adapt to it, while ensuring its affordability. With a key goal of defining "real metrics that are validated and demonstrated," the team recommended a two-part approach: (1) Implement a benchmark/evaluation program; and (2) evaluate products and processes in a test bed. The benchmark program goal would be to develop a knowledge base for evaluating competing products. Efforts in this area should include the investigation of industries outside the traditional DoD purview. The test bed goal would be to experiment and create new data. It would be land-based, perhaps a virtual environment, where candidate elements demonstrated their capabilities. Additionally, the test bed should be linked to other ongoing activities within the Navy, including fleet battle experiments and operational war games.

The Acquisition team's effort included a wide range of topics — from acquisition cycle time and incentivizing/involving industry, to re-orienting the process toward functional capabilities, rather than platform capabilities. The team determined the existing acquisition system will not be able to fully support NCW — the system must become faster. First, the "quest for certainty and studying something to death" must end — this mentality accounts for much of

NETWORK CENTRIC WARFARE

The Navy's concept of Network Centric Warfare was introduced in 1997. NCW envisions dramatic improvements in warfighting effectiveness through networking capabilities within a joint task force (JTF). Under this concept, synergies are created in the areas of sensing and detecting; information exchange and coordination among all task force elements; and conduct of maneuvers.

DD 21 will be the first surface combatant designed from the keel up to embody the principles of NCW by exploiting advanced command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) capabilities DD 21 will provide tactical decision-makers with knowledge — rather than simply data or information — of their surrounding battlespace, while sharing that knowledge with others using direct, interactive communication networks.

Operating seamlessly with other U.S. or allied forward-deployed forces, DD 21 will achieve the effects of mass, or concentration of combat power, without having to physically amass forces as in the past. The "sensor-to-shooter" connectivity envisioned for NCW will provide Naval or JTF commanders the range of firepower options needed to match a given target set with the best combination of hard- and soft-kill weapons, thus increasing overall Joint combat effectiveness.

the long acquisition cycle time. A parallel to NCW, called network centric acquisition, was also proposed. The goal of network centric acquisition would be to reduce cycle time. Industry would have to be involved in the effort — not as merely a recipient of the government's change, but as an active participant. To encourage involvement, incentives for industry must be identified and developed.

- **Anticipated future information environment**
  - *Moore's Law:* Computational Power Doubles Every 18 Months
  - *Connectivity:* Communications capacity increasing even faster
  - *Information*
    > Global coverage, of near real-time proportion
    > Access to national, commercial, foreign remote sensing
  - *Challenges*

Coordinated Tasking	Ensuring Access
Fusion/Integration	Information Warfare
Information Assurance	Coordinating Surveillance, Strike, Maneuver
Training	
Connectivity and Standards	Compatibility with Legacy Systems

FIGURE 4. **Summary of Network Panel**

A significant tension is the asynchronicity between the hull and its mechanical features (long life cycle) and the electronics/network aspects (short life cycle) of a weapon system. Ideally, there should be different venues to purchase long life cycle items and short life cycles, not a "one size fits all" theory of acquisition. For example, products like hulls, once purchased, last for years; conversely, high-tech electronic equipment can be obsolete in less than 24 months. To use the same process for such diverse equipment spells trouble.

The acquisition process should be "scaleable" and should consider that the shortest possible delivery time is not necessarily the aim; rather, the aim is twofold:

- Achieving optimal delivery time, which minimizes or balances competing risks of incorporating systems with potentially immature (beta-test) components.
- Achieving optimal delivery time, while simultaneously minimizing or balancing the issue of rapid market obsolescence.

Insights from AW99

Major insights were gained in the following categories:

- Concept of business war games as an "open exchange of ideas to increase a body of knowledge"

- Warfighter "traction" back to acquisition community
- Need for a network architecture
- Network centric acquisition
- Value of information
- Evolutionary process of NCW.

An important attribute of Navy business wargaming is it provides a forum for an "open exchange of ideas to increase a body of knowledge." AW99 clearly exhibited this attribute, making the process conducive to tackling very difficult issues. Overall, the level of knowledge of NCW increased dramatically from the Initial Planning Conference (February 1999) to AW99. A similar enterprise-level knowledge growth occurred for the Global War Game: "Some saw Global'98 as a change-driving event in understanding the enormous potential of NCW."[2] Recommendations were made to continue the Acquisition Warrior series. It was also noted the process can, and should, be used to address less encompassing issues specific to program managers, who left the business war game with an updated knowledge of the acquisition strategies used throughout the Department of the Navy (and possibly throughout the Department of Defense).

When Navy Vice Adm. Arthur K. Cebrowski, President of the Naval War College was briefed on AW98 in July 1998, he expanded on the notion of "warfighter traction" to include the need for

traction back into the acquisition community. The fundamental idea for the Acquisition Warrior series had always been to work in a tri-perspective environment — that of Warfighting, Technology, and Acquisition — for the overall benefit of the Navy, but primarily within the acquisition community. The notion of traction led to another perspective of impact — Acquisition Warrior could benefit the entire Navy by providing operators or warfighters this traction back into the acquisition community.

Early on in the AW99 process, the scope was limited to addressing the future interoperability challenge; that is, to have DD 21 enter the fleet seamlessly. The focus of AW99 was to identify the important characteristics of a node operating seamlessly in this future environment. Drawing from an extensive list of characteristics, interoperability continued to be identified as the key characteristic or quality of a node in the context of NCW during the war game. Admittedly, game participants struggled to develop this list as well as clear definitions of each characteristic.

Post-game analysis and research suggest this struggle could be symptomatic of the lack of emphasis on the importance of system architecture in the product development process. Product development experts say to have a product capability (e.g., interoperability), we need an architecture. And product architecture is about getting the right product; system engineering is about getting the product right. No amount of system engineering of complex systems can overcome the absence of an architecture. The product architecture is often captured in a "thud document" (as in the "thud" a document makes when it is dropped). The absence of the network architecture surfaced as a pervasive issue at AW99.

The Warfighting team's recommendation is to designate and fund the Navy network architect to implement the Navy's NCW vision in conjunction with joint efforts. The network architect should also act as the focal point for national and allied network centric archi-

tectures. This recommendation is clearly supported by Professor Ed Crawley of the Massachusetts Institute of Technology, who defines the architect's role as including the following responsibilities:

"Define the boundaries and functions, create the concept, allocate the functionality, and define interfaces and abstractions ... the architect is not a generalist but is a specialist in simplifying complexity, resolving ambiguity, and focusing creativity."[3]

Network Centric Acquisition
The characteristics of NCW extend to significant changes required in the acquisition community. If the fleet is to be equipped with systems that allow for NCW, then the community must consider the new business practices in one term, simply, network centric acquisition. The Acquisition team recommended that virtual prototypes be a required item for every system delivered to the Navy. The virtual prototype is necessary, due to the evolutionary development of NCW, and could be used for dynamic assessment of the changing status of the acquisition.

Throughout the game, this notion of moving from "platform centric" acquisition to network centric acquisition was

examined. Key enablers for network centric acquisition included:

• Distributed collaborative planning
• Virtual prototypes
• Metrics for system effectiveness that are linked to cost.

Critical for network centric acquisition is that system effectiveness be linked to cost. Not surprisingly, network centric acquisition faces tensions similar to those of NCW because NCW focuses on the information flow among sensors, command-and-control assets, and engagement platforms, instead of focusing on the platforms themselves. This is in contrast to the Navy's structure, with platform-based programs and cost structures. The platforms will not disappear, so it is not a question of "either/or." By linking system effectiveness to cost, system capability can be tracked, thus providing total procurement cost visibility within the collaborative acquisition enterprise. The recommendation from the Acquisition team is to make a change in the budget exhibit to incorporate a tag for capability (allowing aggregation at the system, ship, battlegroup, and joint force level).

Because network centric operations are characterized by information-intensive

- **Interoperability**
  - Interacts with legacy nodes
  - Architecture common with national (joint) combat and combat support systems
  - Provides critical info to all participants (collects/processes/distributes)

- **Supportability**
  - Easily upgradeable/affordable
  - Supportability tied to mission
  - Minimizes O&S costs
  - Environmentally friendly
  - Can be communicated/distributed across entire acquisition community

- **Quality of Service**
  - Reliable/dependable
  - Able to fight/hurt
  - Prioritization
  - Acts as push/pull node
  - Timely
  - Graceful Degradation
  - Secure at all levels

- **Training/HMI**
  - Minimal training
  - Accommodates cognitive differences
  - Provides self-service HMI

FIGURE 5. **Characteristics of a Highly Effective Node in a Network Centric Environment**

interactions among computational nodes on the network, the "value" is derived from the content, quality, and timeliness of information moving between these nodes. The Logistics team suggested that sustainability consider not only material, but also tactical and nontactical information and personnel: "For a netted system, overall readiness needs to include all the mission participants."

The team also emphasized the inclusion in logistics of measuring and managing availability (Ao) of information systems. Each level (e.g., theater, battlegroup, ship, subsystem) of the system should have a sustainability metric and define Ao in relation to operational performance and availability of the network, blurring the lines between operators and logisticians. But both the Logistics and the Technology teams recognized that information is not the only factor in the value of information: Personnel, or "the human," [4] is the governing factor in NCW. The Technology team pointed out software technology in development today is leading to accounting for cognitive differences: "Eventually, the machine will know the users who are sitting in front of it and will be able to talk to them or display the data in the way each person can best understand it." When this day comes, the necessity to have metrics for valuing information in place will only intensify.

Cebrowski's key challenge is the co-evolution of technology, operational doctrine, and organization:

"Successfully transitioning from platform centric to network centric warfare will involve more than just the introduction of new technology. It requires the co-evolution of that technology with operational concepts, doctrine, and organization. A network centric force operates under a different rule set than a platform centric force. We will have to change how we train, how we organize, and how we allocate our resources."

More Than Just Bridging the Gap

It is not enough to bridge the gap between technology and need. The Navy will increasingly assimilate information technology and find it necessary to adapt or co-evolve organizations and doctrine as it does so. Much of the change is simply the evolving nature of the NCW concept. This evolution is not going to stop in the foreseeable future. A strategy to deal with this issue evolved: (1) Document and publish findings from AW99 to continue the debate; and (2) establish a test bed for continuous evaluation.

Acquisition Warrior could have been called Acquisition Advocate. The necessity to discuss the difficult and sometimes contentious issues promotes understanding, learning, and discovery. Attacking these tension points is critical.

NCW is, and will continue to be, a complex concept. It is an enabler for warfare; it is a process, not a specific product. "Warfare" is the noun that invokes the complexity theory, which suggests that discussion in the area will never be clear-cut or straightforward.

"Complex systems have somehow acquired the ability to bring order and chaos into a special kind of balance. This balance point — often called the edge of chaos — is where the components of a system never quite lock into place, and yet never quite dissolve into turbulence, either."[5]

The answers to Carnevale's questions are an evolving process to which AW99 provided only the opening response to what will surely remain an ongoing dialogue.

Editor's Note: Navy Rear Adm. Joseph A. Carnevale, who is currently the Program Executive Officer for DD 21, the 21st century destroyer and its associated programs, looks forward to continuing this dialogue. Contact him at (703) 602-0616 or by E-mail at **CarnevaleJA@ NAVSEA.NAVY.MIL.** The authors also welcome comments or questions concerning this article. Contact Kowalczyk at (401) 832-1836 or by **E-mail at kowalczyktw@npt.nuwc.navy.mil**. Harrigan can be reached at (401) 832-1835 or by E-mail at **harrigangm@npt.nuwc. navy.mil.**

E N D N O T E S

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3. Crawley, Edward F., Massachusetts Institute of Technology, Aeronautics & Astronautics Department Head. Presentation entitled, "System Architecture," Feb. 11, 1999.
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- Not a single program–specific issue
- No technology impediments
- Establish a Chief Information Technology Officer or Lead System Integrator
- Must be adaptable to *Moore's Law* (18-month double capacity)
- Trades between maintain or replace
- Must trade off minimum onboard maintenance versus more "techies" on board
- Modularity
- Acquisition cycle time reduction
- Get more parties involved

FIGURE 6. **Key Acquisition Findings**